Skeletal Remains

from Mesa Verde National Park / Colorado

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By Kenneth A. Bennett

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Acknowledgments

The description and analysis of the prehistoric skeletal remains of the Indians from Mesa Verde National Park, Colorado, began in 1958 with Frederick S. Hulse, who studied the material from Long House and the Mesa Verde Museum collection. Three years later, Charles F. Merbs contributed original measurements and observations on the remains from Mug House and Badger House. In 1963, I added data derived from the material from Big Juniper House, Two Raven House, Site 1676, and the other sites mentioned in this report.

The difficulties encountered in assembling this report for publication were considerable. Physical anthropologists often take different sets of measurements and observations in order to shed light on specific problems, and the data gathered by Hulse, Merbs, and myself did not always correspond. A systematic attempt was made to use as many of the measurements and observations from all three observers as possible, but some data, particularly those which were not comparable to the Point of Pines material, were not included. Likewise, data that were suspect for any reason (i.e., differences in choices of landmarks, differences in interpretation of discontinuous variants, etc.) were also not used in this study. The practical effect of this was an occasional reduction in sample sizes, and in many instances, statistical procedures were wholly inappropriate. The unavailability of dental material precluded my incorporation of a section on dentition in this report.

For my part, a debt of gratitude is owed to Douglas Osborne, who was then Supervisory Archeologist of the Wetherill Mesa Archeological Project. He provided complete access to the skeletal material, laboratory space at Mesa Verde, and financial assistance from funds provided to the National Park Service from the National Geographic Society. I am grateful to Fred Mang for the excellent photographs, and to Bernard Katz, then project editor, for his assistance. Thanks also go to Alden Hayes, who replaced Osborne as Supervisory Archeologist of the Wetherill Mesa Archeological Project, for his assistance in the completion of an early draft of this manuscript. Raymond H. Thompson, Director of the Arizona State Museum and Chairman of the Department of Anthropology, University of Arizona, provided complete access to the Point of Pines skeletal remains and laboratory space for the comparative aspect of this analysis.

Finally, special recognition must be given to Frederick S. Hulse and Charles F. Merbs, who contributed about half of the data for this analysis. This report would not have been possible without their efforts, but I must add that the responsibility for all statements included herein are my own.

K. A. B.

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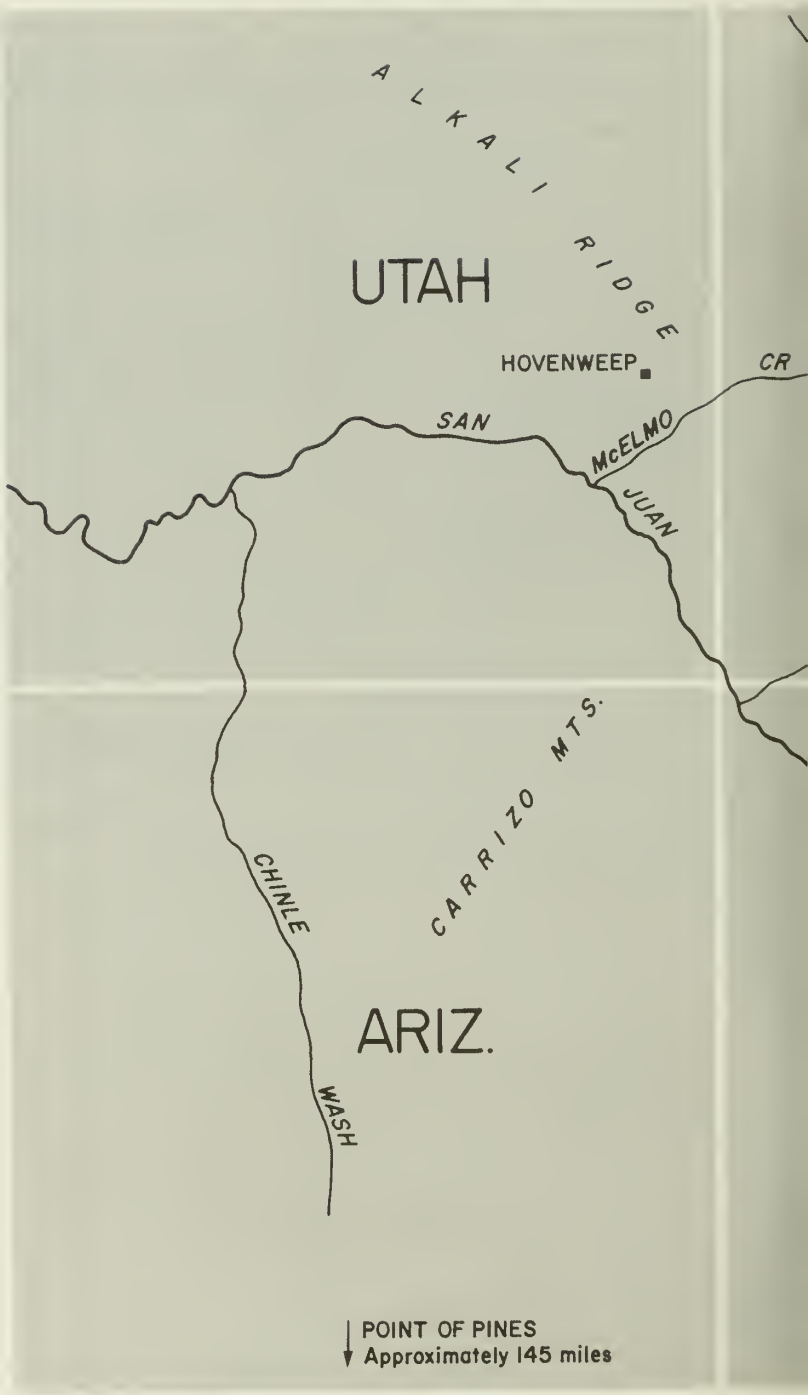
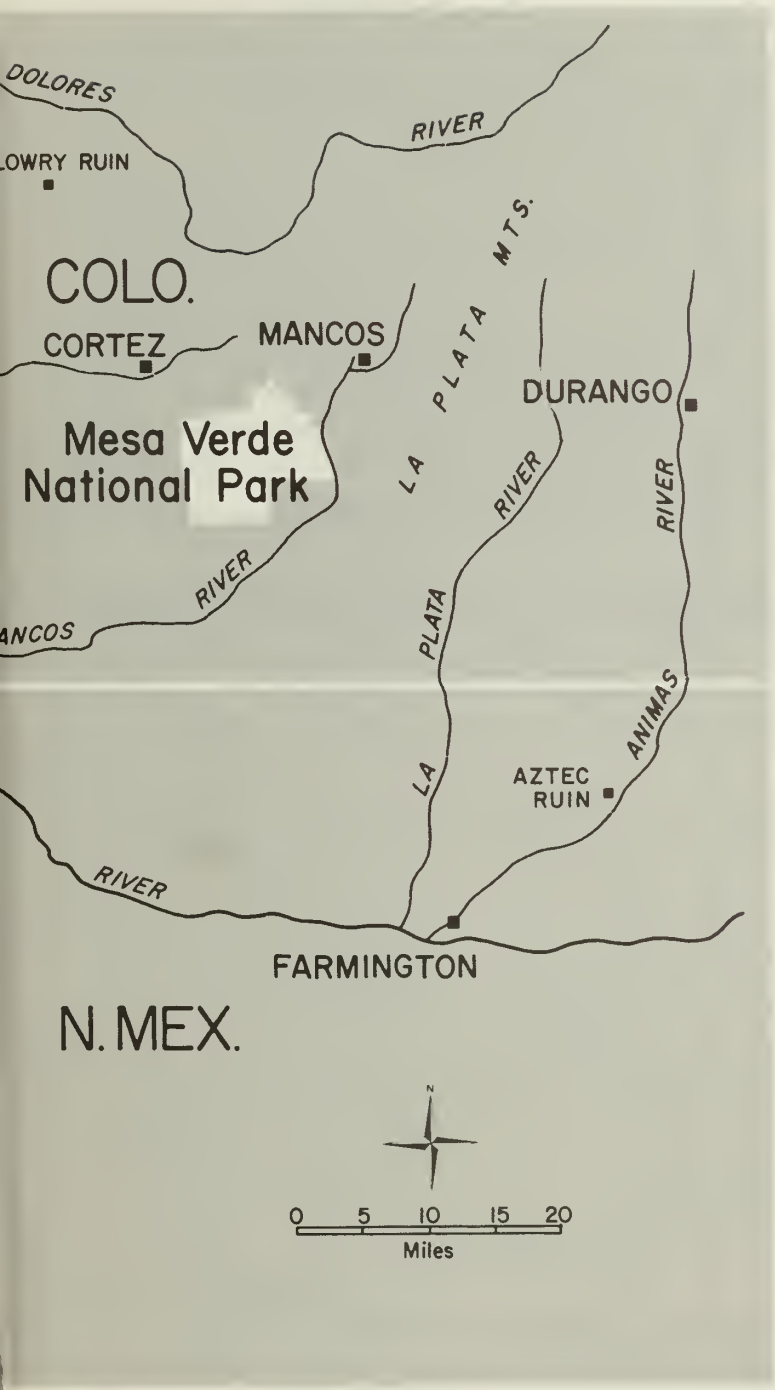


Figure 1 *Mesa Verde National Park, Colorado, and its approximate location relative to the Four Corners area.*

1
Introduction



For many years Mesa Verde National Park (fig. 1) has provided a focal point for intensive archeological investigations (see, e.g., summaries of the prehistory of the area by Kidder, 1924; Reed, 1964; Wormington, 1959). These studies include a number of site reports. A survey of the literature may be found in Rohn (1971), and Hayes (1964); geographical site surveys in Hayes (1964); and more specialized studies concerning archeological methods, prehistoric diets, floral and faunal analyses, problems of dating, and certain aspects of cultural ecology in a single volume by Osborne (1965). However, published reports on the skeletal remains of the early inhabitants of Mesa Verde have been infrequent (Bennett and Hulse, 1966; Reed, 1965; Wade and Armelagos, 1966), and no comprehensive description of the physical characteristics of the population as a whole is available. The primary purpose of this brief report, therefore, is to describe statistically the metric and non-metric osteological characteristics of the population and to compare these data to those from Point of Pines, Arizona, another major center of population in the prehistoric Southwest that was in large part chronologically contemporaneous with Mesa Verde.

From 1946 through 1960, the University of Arizona Archaeological Field School carried out excavations at Point of Pines (located on the San Carlos Apache Indian Reservation about 65 miles east of Globe, and 40 miles north of Safford, Arizona). Of over 500 inhumations recovered, 489 belonged to a homogeneous population associated with the Western Pueblo Culture (Reed, 1950). These date from A.D. 1000 to A.D. 1450, and they were analyzed by Bennett (1973a) in an attempt to shed light on Haury's hypothesis (1958) that the Kayenta Anasazi in northern Arizona migrated into the Point of Pines area during the latter part of the thirteenth century (around A.D. 1285). Although Bennett found that there were remarkably few differences in physical characteristics between the Western Pueblo population at Point of Pines and the Anasazi at Mesa Verde, some of the original data is re-examined here to determine if those findings still hold.

2
The Skeletal Material

Materials and Methods

The skeletal sample under consideration totals 202 individuals. At least 15 individuals are listed only as "Mesa Verde Museum Burials" and have no direct provenience data. The remainder were excavated from eleven sites (Badger House, Big Juniper House, Two Raven House, and Sites 1200, 1229, 1241, 1249, 1253, 1291, 1575, and 1676). Although most of them can be identified with the Mesa Verde Phase (fig. 2), the total span of time begins with the La Plata Phase (Basketmaker III in the Pecos Classification) and ends with the termination of the Mesa Verde Phase (Pueblo III). This represents approximately 900 years of continuous occupation in the Mesa Verde region, from about A.D. 450 to A.D. 1350. Thus, the 202 individuals undoubtedly represent only a tiny fraction of the total number of people who lived in the area.

The ages at death of the adult skeletons were estimated through the use of conventional morphological criteria, including maturational sequences of the symphysis pubis (McKern and Stewart, 1957), fusion at the spheno-occipital synchondrosis (Scott, 1958), and to a lesser extent, the degree of dental attrition based on an attrition scale established specifically for this population. Discriminant function analysis as a method for the determination of sex (Giles and Elliot, 1963)

Figure 2 *Approximate dates and correlation of various periods and phase systems devised for the Mesa Verde area.*

<table>
<tr><th>Date A.D.</th><th colspan="2">Pecos Classification (Watson) (Morris)</th><th>Gila Pueblo (O'Bryan)</th><th>Gladwin (Modified by Reed)</th><th>Roberts</th><th>Alkali Ridge (Brew)</th><th>Wetherill Survey</th></tr>
<tr><td>400</td><td colspan="2">Basketmaker II</td><td></td><td></td><td>Basketmaker Period</td><td></td><td></td></tr>
<tr><td>500</td><td rowspan="2">Basketmaker III</td><td rowspan="3">Basketmaker III
?
Pueblo I
?
Pueblo II
Early Pueblo III</td><td></td><td rowspan="2">La Plata Focus</td><td rowspan="3">Modified Basketmaker Period
Develop-mental Pueblo Period</td><td rowspan="2">?</td><td rowspan="2">La Plata Phase</td></tr>
<tr><td>600</td><td>Four Corners Phase</td></tr>
<tr><td>700</td><td rowspan="2">Pueblo I</td><td rowspan="2">Chapin Mesa Phase</td><td rowspan="2">Abajo Focus</td><td rowspan="2">Piedra Phase</td></tr>
<tr><td>800</td><td>Piedra Focus</td><td>Ackmen Focus</td></tr>
<tr><td>900</td><td rowspan="2">Pueblo II</td><td rowspan="2">Mancos Mesa Phase</td><td rowspan="3">Mancos Focus</td><td rowspan="3">Mancos Focus
?
McElmo Focus
?
Montezuma (Mesa Verde)</td><td>Ackmen Phase</td></tr>
<tr><td>1000</td><td rowspan="2">Early Pueblo III</td><td>Mancos Phase</td></tr>
<tr><td>1100</td><td>McElmo Phase</td><td>McElmo Phase</td></tr>
<tr><td>1200</td><td rowspan="2">Pueblo III</td><td rowspan="2">Late Pueblo III (Mesa Verde Phase)</td><td rowspan="2">Montezuma Phase</td><td>?
McElmo
?</td><td rowspan="2">Great Pueblo Period</td><td rowspan="2">Mesa Verde Phase</td></tr>
<tr><td>1300</td><td>Mesa Verde Focus</td></tr>
</table>

was not possible due to the fragmentary nature of the material, and neither endocranial nor ectocranial suture closure were considered for reasons outlined by Singer (1953), and McKern and Stewart (1957). The estimation of age for individuals under sixteen years was based on the dental eruption sequences given by Kronfeld (1935) for permanent dentition and Meredith (1946) for the deciduous dentition.

The sex of adults was determined primarily by the observation of morphological characteristics of the pelvis. These features included angulation of the greater sciatic notch and in the sub-pubic region, presence or absence of a preauricular sulcus and scars of parturition. In doubtful cases, supportive evidence was obtained from the observation of selected cranial features, such as rugosity of the mastoid processes, in the nuchal region, and on the inferior part of the ascending ramus of the mandible, and the relative size of the supra-orbital tori. Whenever possible, both cranial and pelvic features were used in conjunction with each other, although much more reliance was placed on the latter. No attempt was made to determine the sex of individuals below the age of 16.

All measurements were taken with a standard osteometric board, sliding and hinge calipers, and a Mollison craniophore. The measurements have been described previously by Hrdlicka (1947), Wilder (1920), Hooton (1946), and Martin and Saller (1957). The discontinuous traits observed are among those listed by Berry and Berry (1967), and a comprehensive survey of the literature concerning their etiology may be found in Corruccini (1974).

Cranial Deformation

The meaning of artificial cranial deformation in the prehistoric Southwest has long puzzled physical anthropologists. Stewart (1937) and von Bonin (1937), for example, discussed over 35 years ago the significance of this practice as regards cultural relationships between various populations. Reed (1949) described the geographical and temporal distribution of various types of deformation in the Southwest, and later maintained (1963) that lambdoidal compression was distinctively characteristic of the Anasazi through the end of PIII. While it is true that the most frequently observed type of deformation at Mesa Verde was lambdoidal (figs. 3 through 6), in which the flattened plane was centered roughly around lambda and inclined at an angle of approximately 100 degrees or more from the horizontal plane (fig. 7), vertical occipital deformation was also observed (figs. 8 and 9). In this form, the angle of inclination from the horizontal is approximately 90 degrees or less. In most cases, both types of deformation were slightly asymmetrical.

Although it is generally assumed that the use of cradleboards produced these deformities, there is no direct evidence to confirm this opinion. Likewise, there has been much speculation as to whether cranial deformity was intentional or unintentional, i.e., whether any aesthetic value might have been associated with the end result. It appears reasonable to assume that while vertical compression could be an unintentional side effect of being strapped tightly to a cradleboard, as in the Hopi (Dennis, 1940), lambdoidal flattening would require something specifically designed for this purpose.

At any rate, the presence of both types of deformity at Mesa Verde, along with crania showing no deformation at all, parallels closely the situation at Point of Pines. In this area, 31 percent of 153 crania were lambdoidally deformed, 54 percent were occipitally deformed, and 15 percent were undeformed. Of particular interest is the rather abrupt decrease in the percentage of individuals with lambdoidal deformation (39.7 to 23.8 percent) and the associated increase in undeformed crania (6.9 to 22.5 percent). This shift in preference, for whatever reasons, occurred at a time coincident with the presumed Kayenta Anasazi migration into the Point of Pines area, and the difference between lambdoidally versus undeformed crania is statistically significant ($\chi^2 = 9.32$; with ldf, $P < 0.01$).

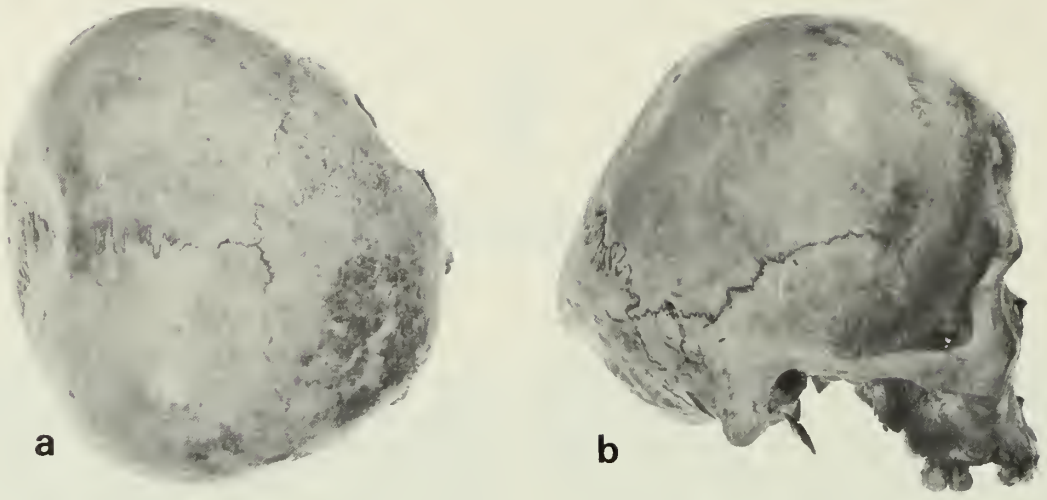


Figure 3 *Pronounced lambdoidal deformation in an adult male from Big Juniper House,* **a**, *top view;* **b**, *side view.*

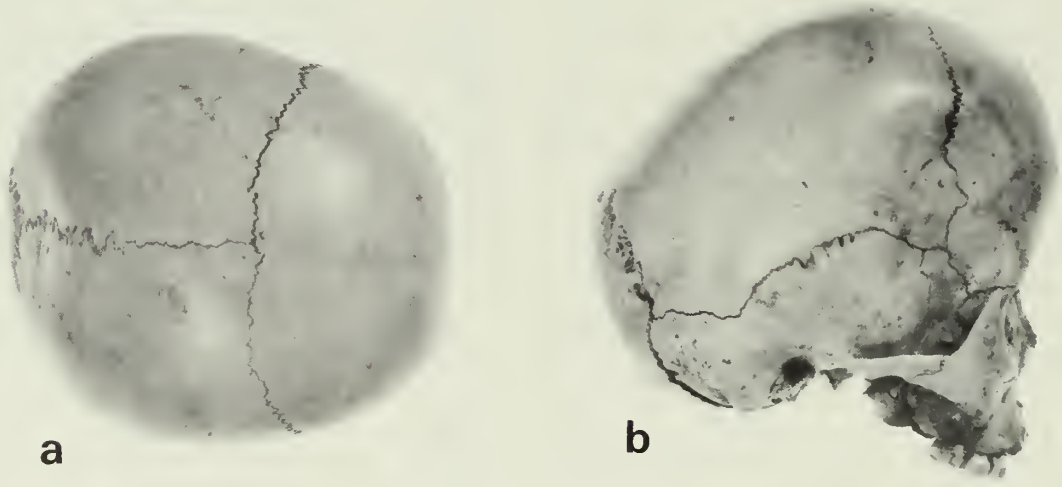


Figure 4 *Pronounced lambdoidal deformation in a child from Big Juniper House,* **a**, *top view;* **b**, *side view.*

Figure 5 *Pronounced lambdoidal deformation in an adult male from Long House,* **a**, *top view;* **b**, *side view.*

Figure 6 *Slight lambdoidal deformation in an adult male from Site 1676,* **a,** *top view;* **b,** *side view.*

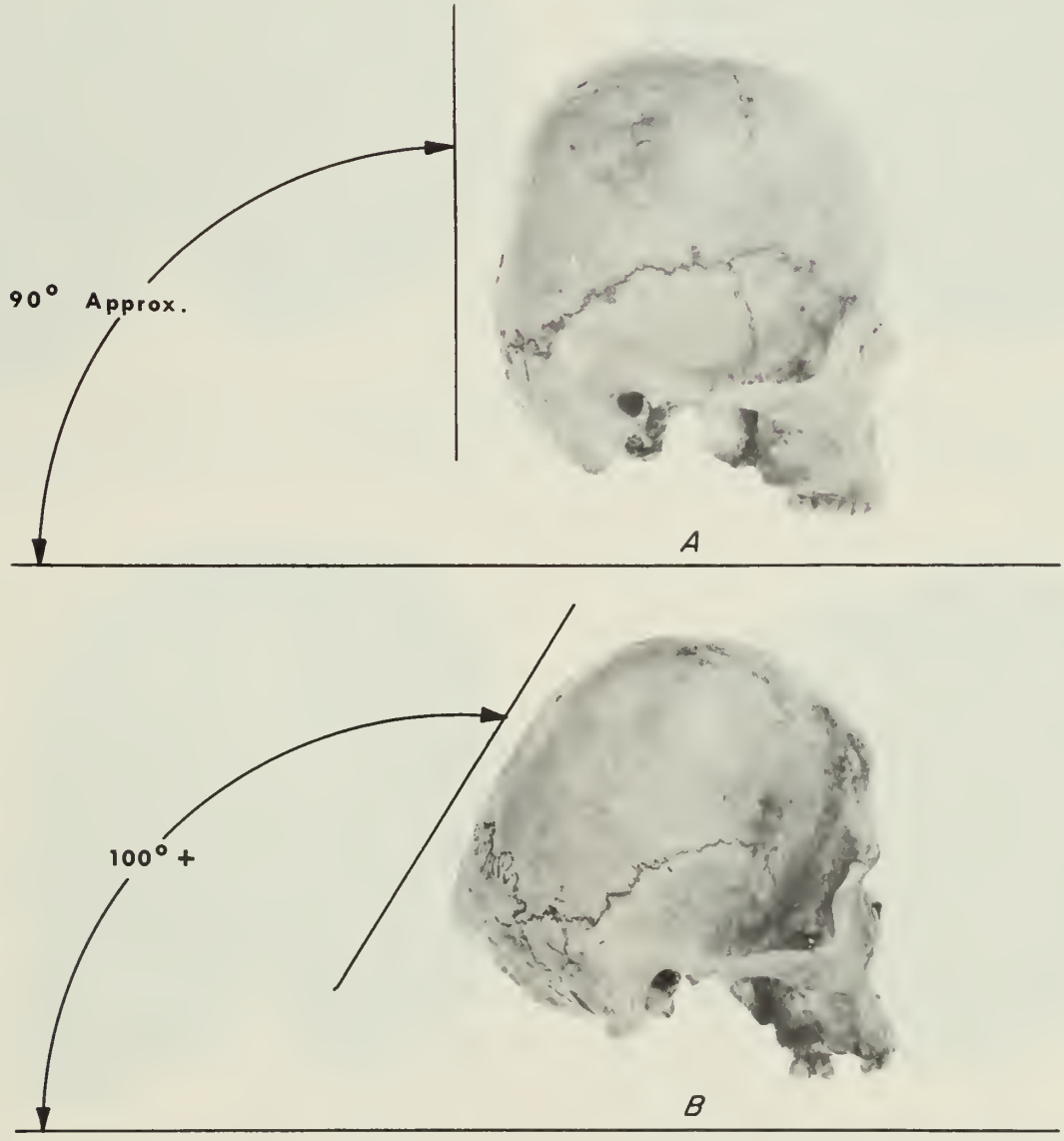


Figure 7 **a,** *Occipital deformation in an adult male skull;* **b,** *lambdoidal deformation in another adult male.*

Figure 8 *Slight occipital deformation in an adult male from Mug House,* ***a****, top view;* ***b****, side view.*

Figure 9 *Moderate occipital deformation in an adult male from Site 1676,* **a**, *top view;* **b**, *side view.*

3
Demography

The skeletal sample is distributed as to age and sex in table 1. There are two generalizations often made about mortality in prehistoric American Indian populations. One holds that female mortality was quite high during the reproductive years, presumably due to death during childbirth, and the other claims that mortality rates were very high in infancy and adolescence. Both of these generalizations appear to have been the case with the Mesa Verde population. If the primary reproductive years in females are assumed to be from late teenage to about 30 years of age, then the difference between females (18) and males (15) in this age range is statistically significant ($\chi^2 = 6.63$; with ldf, $P < 0.02$). Infants and adolescents comprised 36.6 percent of the entire sample, which is without doubt a minimum estimate. Rapid deterioration of infant bones and other factors associated with their recovery contribute to a systematic bias in most samples of this sort. In all likelihood, infant and adolescent mortality in prehistoric populations was much higher than indicated by the recovered skeletal remains. Nevertheless, it is interesting to note that there is no significance in the difference in infant and adolescent mortality at Mesa Verde when compared to that at Point of Pines (table 2).

One of the more convenient ways of summarizing the various mortality characteristics of populations is by life table analysis, but this is rarely possible for early populations because of the unjustifiable assumptions necessary for their construction (Angel, 1969). However, Carrier (1958) developed a method for the estimation of certain mortality characteristics (notably, average life expectancy) that is based on the distibution of deaths by age. This method has been

Table 1. *Age and sex distribution of the skeletal population from Mesa Verde National Park, Colorado.*

Age range	M	Pct.	F	Pct.	Sex unknown	Pct.
Infant					25	12.4
Adolescent					49	24.2
Late teenage	1	0.5	5	2.4	1	0.5
20–25	7	3.5	9	4.5		
26–30	7	3.5	4	2.0		
31–35	10	5.0	2	1.0		
36–40	7	3.5	1	0.5		
41 and over	15	7.4	8	4.0		
Totals	47	23.4	29	14.4	75	37.1
No. of males classified only as adult					11	5.4
No. of females classified only as adult					11	5.4
No. of adults of undetermined sex					29	14.3
Total sample					202	100.0

Table 2. *A comparison of infant and adolescent mortality between Mesa Verde, Colorado, and Point of Pines, Arizona.*

Population	No. of Individuals	No. of Infants and Adolescents	X^2	P
Mesa Verde	202	74	0.22	>0.5
Point of Pines	489	166		

applied by Bennett (1973b) to the Point of Pines skeletal material in an effort to determine its effectiveness on a prehistoric population. It was found that the method, which is based on stable population theory, was not fully applicable because of the unusually high mortality during the early years in the Point of Pines individuals. It failed, for the same reason, when applied in its entirety to the Mesa Verde material. But, it is possible that part of the method may be used to indicate a range of average life expectancy values at one year of age under varying rates of natural increase (r). The method and its application have been described thoroughly by Carrier (1958) and are not repeated here. Instead, average life expectancies have been calculated for both sexes from Mesa Verde and Point of Pines when the intrinsic rate of natural increase is allowed to vary from 0.000 (stationary population) to 0.020. These figures are given in table 3.

Several assumptions were necessary for these calculations. First, an upper limit of 50 years was selected as the final age interval (41–50). This was based on a plot of the average life expectancy curve, and does not imply that all individuals had died by their 50th year. Second, it was necessary to assume a 1:1 secondary sex ratio, since a person would have to be over 16 years old at death for accurate skeletal sex determination. Third, it was assumed that sex and age estimations were accurate and that the sample was random. Finally, it must be stressed that these life expectancy values, although they appear quite low, are doubtlessly too high in light of the probable inadequacy of the infant sample.

Table 3. *Estimates of average life expectancy at one year of age (e_1) on males and females from Mesa Verde, Colorado, and Point of Pines, Arizona.*

Intrinsic Rate of Natural Increase (r)	Mesa Verde		Point of Pines	
	$\mathring{e}_1$ (M)	$\mathring{e}_1$ (F)	$\mathring{e}_1$ (M)	$\mathring{e}_1$ (F)
0.000	23.1	18.7	22.6	24.6
0.001	23.4	18.7	22.8	24.8
0.002	23.5	19.2	22.9	25.0
0.003	23.6	19.2	23.2	25.3
0.004	23.9	19.6	23.4	25.4
0.005	24.2	19.7	23.5	25.6
0.006	24.4	19.7	23.8	25.8
0.007	24.7	20.0	24.0	26.1
0.008	24.8	20.0	24.2	26.2
0.009	25.1	20.5	24.4	26.4
0.010	25.3	20.9	24.6	26.7
0.012	25.8	21.2	24.9	27.0
0.014	26.0	21.6	25.4	27.4
0.016	26.6	22.1	25.8	27.9
0.018	27.2	22.5	26.2	28.2
0.020	27.4	23.1	26.6	28.6

4
Stature

The estimation of stature based on the lengths of long bones of prehistoric American Indians and subsequent comparisons of these estimates to those from other populations have been complicated for several reasons. Perhaps the most important of these is the fact that regression equations for the prediction of stature have not been, nor can they be developed for long dead populations. Thus we have been forced to rely upon other formulae, including those of Pearson (1899), developed on Englishmen and used by Hooton (1930) on the skeletons from Pecos Pueblo; Trotter and Gleser (1952; 1958), developed mainly on American Black and White cadavers; and Genoves (1967), derived from indigenous Mexican Indian Cadavers. Both Pearson's and the Trotter-Gleser equations are inapplicable for use on American Indian populations for reasons involving significant differences in long bone proportionalities between these broad groups. Bennett (1973a) found that the formulae given by Genoves were probably more accurate when applied to Southwestern American Indians, and therefore these were used for the estimates given in table 4.

The mean estimates given in table 4 should not be taken to represent accurate indicators of the actual stature of these Indians, but they are probably accurate enough to make at least two generalizations. These people were rather short by present-day standards, the males averaging about 162 cm. (5 feet 4 inches) and the females approximately 152 cm. (5 feet). In addition, the population exhibits rather remarkable homogeneity, as indicated by the unusually low coefficients of variation. This applies as well to Point of Pines, and the two populations were virtually identical with respect to stature (table 5).

Table 4. *Estimations of stature in males and females from Mesa Verde, Colorado.*

Bone	No.	Mean	Standard Deviation	Standard Error	Coeff. of Variation
MALES					
Femur	22	161.6	3.71	0.79	2.30
Tibia	19	162.4	2.60	0.60	1.60
Humerus	22	160.9	3.05	0.65	1.89
Radius	20	162.7	2.78	0.62	1.71
Ulna	16	162.6	2.78	0.69	1.71
FEMALES					
Femur	12	150.9	3.50	1.01	2.32
Tibia	11	152.8	3.85	1.16	2.52
Humerus	11	151.0	3.91	1.18	2.59
Radius	12	152.8	3.53	1.02	2.31
Ulna	11	151.5	3.07	0.93	2.03

Table 5. *A comparison of stature estimates taken on the long bones of males and females from Mesa Verde, Colorado, and Point of Pines, Arizona.*

	Point of Pines			Mesa Verde				
Bone	N	Mean	S.D.	N	Mean	S.D.	t	P
MALES								
Femur	86	160.8	4.52	22	161.6	3.71	0.76	>0.4
Tibia	71	163.5	4.12	19	162.4	2.60	1.09	>0.2
Humerus	88	161.0	3.79	22	160.9	3.05	0.11	>0.9
Radius	60	162.1	4.17	20	162.7	2.78	0.59	>0.5
Ulna	54	162.4	4.81	16	162.6	2.78	0.16	>0.8
FEMALES								
Femur	90	151.0	5.60	12	150.9	3.50	0.06	>0.9
Tibia	75	153.0	5.29	11	152.8	3.85	0.12	>0.9
Humerus	93	152.1	5.41	11	151.0	3.91	0.65	>0.5
Radius	60	153.4	4.57	12	152.8	3.53	0.42	>0.6
Ulna	51	154.4	4.90	11	151.5	3.07	1.85	>0.05

5
Metric Analysis

Cranial

A total of 23 cranial measurements were taken on the Mesa Verde skulls, all of which are comparable with those taken on the Point of Pines material. Each variable is described briefly below, and each is given a C-number which will identify it in all subsequent tables.

C1—Maximum length of the skull; the maximum glabello-occipital diameter of the vault.

C2—Maximum breadth of the skull; the greatest transverse diameter above the supramastoid crests.

C3—Basion-bregma height; the linear distance from the lowest point on the anterior edge of the foramen magnum (basion) to bregma.

C4—Auricular height; breadths between poria and from each porion to bregma; taken with a Mollison craniophore.

C5—Minimum frontal diameter; the smallest frontal breadth.

C6—Maximum bizygomatic breadth; greatest breadth across the zygomatic arches.

C7—Endobasion-nasion; distance between the endobasion and nasion.

C8—Endobasion-alveolar point; distance between the endobasion and the prealveolar point.

C9—Total facial height; distance between nasion and gnathion.

C10—Upper facial height; distance between the prealveolar point and nasion.

C11—Nasal height; height from the mid-point of a line connecting the lowest parts of the borders of the two nasal notches to nasion.

C12—Nasal breadth; maximum breadth of the nasal cavity.

C13—Orbital height; the maximum height between normal inferior and superior borders, exclusive of any notches.

C14—Orbital breadth; the greatest breadth of the orbital lumen from the dacryon.

C15—Interorbital breadth; distance between the right and left maxillofrontales.

C16—Biorbital breadth; distance between the two frontomalaria orbitalia.

C17—External alveoloar length; the prosthion-alveolon line.

C18—External alveolar breadth; distance between the two ectomalaria, i.e., the most lateral points upon the outer surface of the alveolar ridge opposite the second molar teeth.

C19—Bicondylar width; the greatest breadth between the lateral surfaces of the two mandibular condyles.

C20—Bigonial diameter; the maximum diameter externally on the angles of the jaw.

C21—Symphyseal height; the height from the lowest median point of the jaw at the symphysis to the lower alveolar point.

C22—Minimum breadth of the ascending ramus; the smallest anteroposterior diameter of the ramus.

C23—Condylo-symphyseal length; the distance from a tangent across both mandibular condyles to the most anterior point of the mental process.

In addition to these, ten indices were calculated. These are all standardized ratios that can be found in most textbooks on physical anthropology, and include the cranial index (CI1), cranial module (CI2), mean height index (CI3), length-height index (CI4), breadth-height index (CI5), upper facial index (CI6), total facial index (CI7), nasal index (CI8), orbital index (CI9), and the maxillo-alveolar index (CI10). The metric variables in the skull are described statistically in tables 6 and 7 (males and females, respectively). All single measurements, both cranial and postcranial, and the indices may be found in appendices 1 through 4. Only those variables for which the sample size was 10 or greater were given any statistical treatment. Tables 8 and 9 list the results (t-values and the associated probability levels) of the comparisons of these variables between Mesa Verde and Point of Pines.

The striking similarities between the metric variables of the Mesa Verde and Point of Pines crania are

evident after an examination of tables 8 and 9. In males, only 3 of 22 measurements (maximum length of the skull, orbital breadth, and minimum breadth of the ascending ramus) and two of the associated indices (mean height index and orbital index) differed at the 0.05 level of significance. The greater cranial length among Mesa Verde males and the higher mean height index among Point of Pines males may be explained adequately in terms of artificial deformation practices. The preference of lambdoidal over occipital deformation at Mesa Verde and the opposite preference at Point of Pines would result, on the average, in longer and relatively lower skulls at Mesa Verde. The significance in the difference in orbital breadth (and the associated orbital index) offers no simple explanation, nor does the difference in the minimum breadth of the ascending ramus. In females, only orbital height (of a total of 8 measurements) differed significantly between the two populations, and it is unfortunate in this respect that the samples of female crania were so few. Again, this difference can not be readily explained. In sum, the similarities between both male and female crania from these two populations far outweigh the differences, and there is no reason to assume that the populations were genetically different with regard to the factors that control cranial form.

Post-cranial

Fifty post-cranial measurements were taken on each complete skeleton. As these have been defined by a number of authors and are, for the most part, self-explanatory, I shall not describe them here. Instead, the reader may find their descriptions in the following sources:

Table 6. *Descriptive statistics of the craniometric variables of the adult males from Mesa Verde, Colorado.*

Measurement No.	N	Mean	Std. Dev.	Std. Error	C.V.
C1	12	169.9	6.59	1.90	3.88
C2	11	141.5	6.02	1.82	4.26
C3	14	139.1	7.02	1.87	5.04
C4	4	118.3			
C5	20	95.4	3.99	0.89	4.19
C6	18	136.6	6.18	1.46	4.52
C7	17	100.6	4.05	0.98	4.02
C8	16	93.8	4.73	1.18	5.04
C9	16	120.2	6.33	1.58	5.26
C10	21	72.6	5.64	1.23	7.78
C11	23	51.4	3.33	0.69	6.47
C12	23	25.4	1.47	0.31	5.79
C13	23	35.0	1.33	0.28	3.81
C14	23	39.0	2.21	0.46	5.65
C15	16	24.6	2.90	0.72	11.80
C16	21	98.4	3.17	0.69	3.22
C17	15	55.5	3.54	0.91	6.38
C18	14	66.0	3.51	0.94	5.32
C19	16	120.0	5.66	1.41	4.71
C20	18	98.5	7.99	1.88	8.12
C21	20	34.8	2.33	0.52	6.70
C22	20	36.5	2.00	0.44	5.44
C23	11	106.1	5.52	1.66	5.20
Indices					
CI1	11	83.5	6.61	1.99	7.92
CI2	11	149.8	2.40	0.72	1.60
CI3	11	88.4	3.80	1.15	4.30
CI4	11	81.3	5.55	1.67	6.83
CI5	11	97.6	4.16	1.25	4.26
CI6	16	53.4	4.47	1.12	8.37
CI7	13	88.5	5.65	1.57	6.38
CI8	23	49.6	3.92	0.82	7.90
CI9	23	89.8	5.73	1.19	6.38
CI10	14	119.2	7.93	2.12	6.65

Hooton, 1946—(a) All measurements of the femur and tibia (with the exception of the middle-shift circumference), and (b) sacral length and breadth.

Hrdlicka, 1947—(a) All measurements of the humerus with the exception of the middle-shaft circumference and maximum diameter of the head, and (b) maximum lengths of the radius, ulna, fibula, and clavicle.

Wilder, 1920—(a) Middle-shaft circumferences of the humerus, femur, and tibia, (b) maximum diameter of the head of the humerus, and (c) physiological length of the radius.

Listed below are the measurements. Each one is given a PC designation for tabular convenience. The 21 indices computed from these measurements are given PCI designations.

PC1—Left humerus, maximum length.

PC2—Left humerus, maximum middle-shaft diameter.

PC3—Left humerus, minimum middle-shaft diameter.

PC4—Left humerus, maximum diameter of the head.

PC5—Left humerus, middle-shaft circumference.

PC6—Right humerus, maximum length.

PC7—Right humerus, maximum middle-shaft diameter.

PC8—Right humerus, minimum middle-shaft diameter.

PC9—Right humerus, maximum diameter of the head.

PC10—Right humerus, middle-shaft circumference.

PC11—Maximum length of the left clavicle.

Table 7. *Descriptive statistics of the craniometric variables of the adult females from Mesa Verde, Colorado.*

Measurement No.	N	Mean	Std. Dev.	Std. Error	C.V.
C1	7	163.1			
C2	6	141.7			
C3	5	136.8			
C4	1	120.0			
C5	5	90.6			
C6	9	127.1			
C7	7	95.9			
C8	7	92.6			
C9	9	107.7			
C10	11	65.5	3.42	1.03	5.22
C11	13	47.7	3.09	0.86	6.48
C12	12	25.3	1.61	0.47	6.37
C13	11	33.6	1.21	0.36	3.59
C14	11	36.0	1.84	0.56	5.12
C15	7	23.3			
C16	8	95.0			
C17	5	50.0			
C18	5	59.8			
C19	8	115.1			
C20	10	93.3	6.70	2.12	7.18
C21	10	31.2	3.88	1.23	12.44
C22	11	33.3	2.61	0.79	7.85
C23	5	101.8			
Indices					
CI1	6	86.5			
CI2	4	145.6			
CI3	4	90.7			
CI4	4	88.9			
CI5	4	95.8			
CI6	9	51.3			
CI7	7	86.3			
CI8	12	53.2	4.20	1.21	7.88
CI9	11	93.6	5.46	1.65	5.83
CI10	5	120.0			

PC12—Maximum length of the right clavicle.
PC13—Left femur, maximum length.
PC14—Left femur, bicondylar length.
PC15—Left femur, middle-shaft circumference.
PC16—Left femur, maximum diameter of the head.
PC17—Left femur, antero-posterior sub-trochanteric diameter.
PC18—Left femur, transverse sub-trochanteric diameter.
PC19—Left femur, antero-posterior middle-shaft diameter.
PC20—Left femur, transverse middle-shaft diameter.
PC21—Right femur, maximum length.
PC22—Right femur, bicondylar length.
PC23—Right femur, middle-shaft circumference.
PC24—Right femur, maximum diameter of the head.
PC25—Right femur, antero-posterior sub-trochanteric diameter.
PC26—Right femur, transverse sub-trochanteric diameter.
PC27—Right femur, antero-posterior middle-shaft diameter.
PC28—Right femur, transverse middle-shaft diameter.

Table 8. *Comparisons of the craniometric variables on adult males from Mesa Verde, Colorado, with those from Point of Pines, Arizona.**

Measurement No.	Point of Pines			Mesa Verde			t	P
	N	Mean	S.D.	N	Mean	S.D.		
C1	17	163.8	8.0	12	169.9	6.59	2.09	<0.05
C2	17	141.7	5.7	11	141.5	6.02	0.09	>0.9
C3	13	139.8	5.3	14	139.1	7.02	0.28	>0.7
C5	30	93.0	4.3	20	95.4	3.99	1.95	>0.05
C6	18	133.9	6.5	18	136.6	6.18	1.24	>0.2
C7	14	99.2	4.6	17	100.6	4.05	0.88	>0.3
C8	13	97.1	5.2	16	93.8	4.73	1.73	>0.05
C9	11	118.0	6.6	16	120.2	6.33	0.84	>0.4
C10	23	70.2	5.2	21	72.6	5.64	1.44	>0.1
C11	26	49.8	3.4	23	51.4	3.33	1.63	>0.1
C12	26	25.0	2.3	23	25.4	1.47	0.70	>0.4
C13	25	35.5	2.4	23	35.0	1.33	0.87	>0.3
C14	25	37.6	1.5	23	39.0	2.21	2.54	<0.02
C15	23	24.3	2.2	16	24.6	2.90	0.36	>0.7
C16	25	97.2	3.4	21	98.4	3.17	1.20	>0.02
C17	25	55.1	4.5	15	55.5	3.54	0.29	>0.7
C18	25	64.7	4.1	14	66.0	3.51	0.97	>0.3
C19	50	123.3	9.0	16	120.0	5.66	1.36	>0.1
C20	56	102.4	7.3	18	98.5	7.99	1.90	>0.05
C21	52	34.9	2.8	20	34.8	2.33	0.14	>0.8
C22	65	32.7	3.0	20	36.5	2.00	5.25	<0.01
C23	50	102.1	6.4	11	106.1	5.52	1.89	>0.05
Indices								
CI1	17	86.3	7.1	11	83.5	6.61	1.01	>0.3
CI2	13	148.3	3.4	11	149.8	2.40	1.17	>0.2
CI3	13	91.8	3.6	11	88.4	3.80	2.15	<0.05
CI4	13	85.3	5.3	11	81.3	5.55	1.72	>0.1
CI5	13	99.5	4.8	11	97.6	4.16	0.98	>0.3
CI6	17	52.4	3.8	16	53.4	4.47	0.67	>0.5
CI7	11	87.5	5.0	13	88.5	5.65	0.44	>0.6
CI8	26	50.0	5.1	23	49.6	3.92	0.30	>0.7
CI9	26	94.5	6.0	23	89.8	5.73	2.74	<0.01
CI10	23	117.1	8.4	14	119.2	7.93	0.73	>0.4

*Comparisons were not made where sample sizes in either population were less than ten.

PC29—Left tibia, maximum length.
PC30—Left tibia, antero-posterior nutritive foramen diameter.
PC31—Left tibia, transverse nutritive foramen diameter.
PC32—Left tibia, middle-shaft circumference.
PC33—Left tibia, antero-posterior middle-shaft diameter.
PC34—Left tibia, transverse middle-shaft diameter.
PC35—Right tibia, maximum length.
PC36—Right tibia, antero-posterior nutritive foramen diameter.
PC37—Right tibia, transverse nutritive foramen diameter.
PC38—Right tibia, middle-shaft circumference.
PC39—Right tibia, antero-posterior middle-shaft diameter.
PC40—Right tibia, transverse middle-shaft diameter.
PC41—Left radius, maximum length.
PC42—Left radius, physiological length.
PC43—Right radius, maximum length.
PC44—Right radius, physiological length.
PC45—Left ulna, maximum length.
PC46—Right ulna, maximum length.
PC47—Maximum length of the sacrum.
PC48—Maximum breadth of the sacrum.
PC49—Left fibula, maximum length.
PC50—Right fibula, maximum length.

Indices

PCI1—Right humero-femoral index.
PCI2—Left humero-femoral index.
PCI3—Right humerus, middle index.
PCI4—Left humerus, middle index.
PCI5—Right claviculo-humeral index.
PCI6—Left claviculo-humeral index.
PCI7—Right femur, pilastric index.
PCI8—Left femur, pilastric index.
PCI9—Right femur, platymeric index.
PCI10—Left femur, platymeric index.
PCI11—Right femur, middle index.
PCI12—Left femur, middle index.
PCI13—Right tibio-femoral index.
PCI14—Left tibio-femoral index.
PCI15—Right tibia, platycnemic index.
PCI16—Left tibia, platycnemic index.
PCI17—Right tibia, middle index.
PCI18—Left tibia, middle index.
PCI19—Right humero-radial index.
PCI20—Left humero-radial index.
PCI21—Sacral index.

The descriptive statistics for the post-cranial metric variables on males and females respectively from Mesa Verde are found in tables 10 and 11. They are compared by t-tests to the Point of Pines data in tables 12 and 13. As with the craniometric comparisons, statistical treatment was not given to the post-cranial variables when the sample size was less than ten in either population.

The similarity in the post-cranial skeletons between Point of Pines and Mesa Verde males is even more striking than that evidenced by their skulls. Of 34 measurements and 12 indices that were compared, only a single measurement (antero-posterior middle-shaft diameter of the left femur) differed at the 0.05 level of significance. There was no difference in this same dimension on the right femur. Unfortunately, the Mesa Verde female sample sizes were so small that they

Table 9. *Comparisons of the craniometric variables on adult females from Mesa Verde, Colorado, with those from Point of Pines, Arizona.**

Measurement No.	Point of Pines			Mesa Verde			t	P
	N	Mean	S.D.	N	Mean	S.D.		
C10	28	66.6	3.6	11	65.5	3.42	0.85	>0.3
C11	31	47.2	2.9	13	47.7	3.09	0.50	>0.6
C12	31	24.6	2.0	12	25.3	1.61	1.06	>0.2
C13	33	35.2	2.0	11	33.6	1.21	2.45	<0.02
C14	33	36.8	1.6	11	36.0	1.84	1.36	>0.1
C20	62	94.2	4.9	10	93.3	6.70	0.50	>0.6
C21	54	33.0	2.8	10	31.2	3.88	1.72	>0.05
C22	71	31.4	3.1	11	33.3	2.61	1.91	>0.05
Indices								
CI8	31	52.3	4.3	12	53.2	4.20	0.61	>0.5
CI9	32	95.6	6.4	11	93.6	5.46	0.90	>0.3

*Comparisons were not made where sample sizes in either population were less than ten.

were considered marginal, and only 11 measurements and 7 indices could be compared. Of these, one index and 5 measurements were significantly different. On the basis of these post-cranial comparisons, in addition to the craniometric evidence, it appears reasonable to regard the populations at Mesa Verde and Point of Pines as virtually identical with respect to their skeletal structure.

Table 10. *Descriptive statistics of the post-cranial metric variables of the adult males from Mesa Verde, Colorado.*

Measurement No.	N	Mean	Std. Dev.	Std. Error	C.V.
PC1	17	307.5	11.90	2.89	3.87
PC2	16	21.1	1.96	0.49	9.29
PC3	8	15.4			
PC4	13	43.6	2.76	0.76	6.32
PC5	4	61.8			
PC6	16	312.5	13.17	3.29	4.21
PC7	14	21.8	1.89	0.50	8.67
PC8	6	15.7			
PC9	13	43.5	3.43	0.95	7.88
PC10	5	62.6			
PC11	10	149.0	9.67	3.06	4.48
PC12	8	152.3			
PC13	17	431.8	16.63	4.03	3.85
PC14	15	427.2	17.44	4.50	4.08
PC15	7	80.3			
PC16	14	42.8	2.08	0.56	4.87
PC17	17	23.5	2.00	0.49	8.54
PC18	17	31.4	4.11	1.00	13.08
PC19	19	27.1	2.34	0.54	8.67
PC20	19	23.6	2.17	0.50	9.20
PC21	17	431.9	19.17	4.65	4.44
PC22	13	426.3	20.63	5.72	4.84
PC23	5	81.2			
PC24	17	43.1	2.08	0.50	4.82
PC25	19	24.2	2.14	0.49	8.87
PC26	19	31.4	2.89	0.66	9.22
PC27	18	27.3	2.57	0.60	9.39
PC28	18	23.7	1.97	0.46	8.33
PC29	18	363.5	14.75	3.48	4.06
PC30	23	34.8	2.83	0.59	8.13
PC31	23	21.3	2.17	0.45	10.15
PC32	9	77.7			
PC33	9	30.1			
PC34	9	20.2			
PC35	14	365.9	14.00	3.74	3.83
PC36	17	36.4	3.02	0.73	8.31
PC37	18	21.4	2.92	0.69	13.59
PC38	5	81.4			
PC39	6	31.0			
PC40	5	20.2			
PC41	18	241.3	11.45	2.69	4.74
PC42	5	223.6			
PC43	13	244.3	7.85	2.18	3.21
PC44	4	228.8			
PC45	15	259.3	11.60	3.00	4.48
PC46	11	260.9	8.93	2.69	3.42
PC47	10	112.6	9.90	3.13	8.79

Table 10 (*con't.*)

Measurement No.	N	Mean	Std. Dev.	Std. Error	C.V.
PC48	10	115.6	3.37	1.07	2.92
PC49	10	356.3	13.19	4.17	3.70
PC50	10	357.2	14.30	4.52	4.00
Indices					
PCI1	7	72.7			
PCI2	10	71.8	1.26	0.40	1.75
PCI3	6	70.5			
PCI4	8	72.4			
PCI5	7	49.0			
PCI6	7	48.3			
PCI7	18	116.3	14.65	3.45	12.60
PCI8	18	117.1	14.36	3.38	12.27
PCI9	19	76.9	5.89	1.35	7.66
PCI10	17	75.3	6.91	1.67	9.17
PCI11	18	86.9	11.12	2.62	12.80
PCI12	19	87.0	11.64	2.67	13.38
PCI13	9	86.0			
PCI14	13	85.3	2.00	0.55	2.34
PCI15	18	59.5	5.86	1.38	9.86
PCI16	23	61.5	5.35	1.12	8.71
PCI17	5	64.9			
PCI18	9	66.5			
PCI19	15	77.4	2.61	0.67	3.40
PCI20	15	77.4	2.93	0.76	3.79
PCI21	9	103.8			

Table 11. *Descriptive statistics of the post-cranial metric variables of the adult females from Mesa Verde, Colorado.*

Measurement No.	N	Mean	Std. Dev.	Std. Error	C.V.
PC1	6	278.8			
PC2	7	20.4			
PC3	3	13.7			
PC4	6	37.0			
PC5	2	58.5			
PC6	8	287.9			
PC7	7	21.1			
PC8	3	15.0			
PC9	7	38.6			
PC10	2	59.5			
PC11	3	133.0			
PC12	2	137.5			
PC13	10	398.1	12.60	3.98	3.17
PC14	4	386.5			
PC15	2	72.5			
PC16	10	38.4	1.96	0.62	5.09
PC17	10	21.1	1.73	0.55	8.19
PC18	10	28.7	1.77	0.56	6.16
PC19	10	24.1	2.08	0.66	8.63
PC20	10	21.3	1.70	0.54	7.99
PC21	7	402.6			
PC22	6	396.0			
PC23	3	70.0			
PC24	10	38.6	2.22	0.70	5.75
PC25	12	20.8	1.59	0.46	7.61
PC26	12	28.6	1.68	0.48	5.87
PC27	11	23.7	2.10	0.63	8.86
PC28	11	20.5	2.50	0.76	12.24
PC29	9	339.9			
PC30	9	30.3			
PC31	9	19.0			
PC32	2	75.5			
PC33	2	29.0			
PC34	2	18.0			
PC35	7	333.6			
PC36	7	30.6			
PC37	7	19.4			
PC38	2	76.0			
PC39	2	28.0			
PC40	2	18.0			
PC41	7	219.4			
PC42	3	207.0			
PC43	8	219.5			
PC44	3	209.0			
PC45	7	234.3			
PC46	8	228.9			
PC47	8	101.6			
PC48	7	114.3			
PC49	5	325.0			
PC50	5	327.8			

Table 11 (*con't.*)

Measurement No.	N	Mean	Std. Dev.	Std. Error	C.V.
Indices					
PCI1	4	72.5			
PCI2	2	71.5			
PCI3	3	70.3			
PCI4	3	66.2			
PCI5	2	48.2			
PCI6	3	48.1			
PCI7	11	117.1	12.79	3.86	10.93
PCI8	10	113.2	5.44	1.72	4.80
PCI9	13	72.7	2.94	0.82	4.05
PCI10	10	73.5	3.99	1.26	5.43
PCI11	11	86.2	8.29	2.50	9.61
PCI12	10	88.5	4.26	1.35	4.81
PCI13	4	85.3			
PCI14	5	85.1			
PCI15	9	63.1			
PCI16	10	62.2	3.91	1.24	6.28
PCI17	2	64.3			
PCI18	2	62.0			
PCI19	5	78.1			
PCI20	5	76.7			
PCI21	7	117.4			

Table 12. *Comparison of the post-cranial metric variables on adult males from Mesa Verde, Colorado, with those from Point of Pines, Arizona.**

Measurement No.	Point of Pines			Mesa Verde			t	P
	N	Mean	S.D.	N	Mean	S.D.		
PC1	61	312.0	15.5	17	307.5	11.90	1.10	>0.2
PC2	77	20.9	1.4	16	21.1	1.96	0.47	>0.6
PC4	64	43.5	2.4	13	43.6	2.76	0.13	>0.8
PC6	69	310.8	15.6	16	312.5	13.17	0.40	>0.6
PC7	78	21.8	1.3	14	21.8	1.89	identical	
PC9	71	44.0	2.4	13	43.5	3.43	0.63	>0.5
PC11	21	149.6	8.7	10	149.0	9.67	0.17	>0.8
PC13	68	431.6	19.4	17	431.8	16.63	0.04	>0.9
PC14	68	428.0	19.2	15	427.2	17.44	0.15	>0.8
PC16	83	43.8	2.5	14	42.8	2.08	1.40	>0.1
PC17	94	23.7	1.9	17	23.5	2.00	0.39	>0.6
PC18	94	30.5	2.3	17	31.4	4.11	1.27	>0.2
PC19	87	28.5	2.6	19	27.1	2.34	2.15	<0.05
PC20	87	23.7	2.1	19	23.6	2.17	0.18	>0.8
PC21	67	429.7	20.1	17	431.9	19.17	0.40	>0.6
PC22	67	426.2	19.6	13	426.3	20.63	0.02	>0.9
PC24	78	43.9	2.4	17	43.1	2.08	1.26	>0.2
PC25	88	24.1	1.8	19	24.2	2.14	0.21	>0.8
PC26	88	30.4	2.3	19	31.4	2.89	1.62	>0.1
PC27	87	28.1	2.5	18	27.3	2.57	1.22	>0.2
PC28	87	24.3	2.1	18	23.7	1.97	1.10	>0.2
PC29	58	370.3	22.1	18	363.5	14.75	1.21	>0.2
PC30	76	34.8	2.6	23	34.8	2.83	identical	
PC31	76	21.4	2.1	23	21.3	2.17	0.20	>0.8
PC35	54	367.9	21.6	14	365.9	14.00	0.32	>0.7
PC36	71	35.0	2.7	17	36.4	3.02	1.86	>0.05
PC37	71	21.5	1.9	18	21.4	2.92	0.18	>0.8
PC41	47	240.6	9.9	18	241.3	11.45	0.24	>0.8
PC43	39	243.3	13.5	13	244.3	7.85	0.25	>0.8
PC45	38	257.3	10.4	15	259.3	11.60	0.60	>0.4
PC46	36	259.4	16.1	11	260.9	8.93	0.29	>0.8
PC47	25	110.0	8.1	10	112.6	9.90	0.78	>0.4
PC48	23	114.3	7.6	10	115.6	3.37	0.50	>0.6
PC49	10	354.9	27.7	10	356.3	13.19	0.14	>0.8
Indices								
PCI2	42	72.7	1.6	10	71.8	1.26	1.62	>0.1
PCI7	84	116.9	10.5	18	116.3	14.65	0.20	>0.8
PCI8	86	121.1	10.2	18	117.1	14.36	1.38	>0.1
PCI9	85	80.2	9.0	19	76.9	5.89	1.51	>0.1
PCI10	93	77.8	5.7	17	75.3	6.91	1.59	>0.1
PCI11	84	86.1	7.8	18	86.9	11.12	0.36	>0.7
PCI12	86	83.2	7.0	19	87.0	11.64	1.85	>0.05
PCI14	44	85.9	2.0	13	85.3	2.00	0.93	>0.3
PCI15	69	62.1	5.8	18	59.5	5.86	1.67	>0.05
PCI16	72	62.0	6.1	23	61.5	5.35	0.35	>0.7
PCI19	29	77.9	1.9	15	77.4	2.61	0.71	>0.4
PCI20	37	77.1	2.2	15	77.4	2.93	0.40	>0.6

*Comparisons were not made where sample sizes in either population were less than ten.

Table 13. *Comparisons of the post-cranial metric variables on adult females from Mesa Verde, Colorado, with those from Point of Pines, Arizona.**

Measurement No.	Point of Pines			Mesa Verde			t	P
	N	Mean	S.D.	N	Mean	S.D.		
PC13	76	401.1	23.2	10	398.1	12.60	0.40	>0.6
PC16	91	39.2	2.3	10	38.4	1.96	1.05	>0.2
PC17	108	21.7	2.0	10	21.1	1.73	0.91	>0.3
PC18	108	28.5	2.2	10	28.7	1.77	0.28	>0.7
PC19	102	25.4	1.8	10	24.1	2.08	2.13	<0.05
PC20	102	23.0	2.0	10	21.3	1.70	2.57	<0.02
PC24	94	39.2	2.3	10	38.6	2.22	0.78	>0.4
PC25	109	21.9	1.8	12	20.8	1.59	2.01	<0.05
PC26	109	28.3	2.1	12	28.6	1.68	0.47	>0.6
PC27	109	25.6	1.9	11	23.7	2.10	3.10	<0.01
PC28	109	22.8	1.9	11	20.5	2.50	3.67	<0.01
Indices								
PCI7	114	113.1	6.1	11	117.1	12.79	1.80	>0.05
PCI8	103	110.9	7.8	10	113.2	5.44	0.90	>0.3
PCI9	113	77.7	6.9	13	72.7	2.94	2.57	<0.01
PCI10	109	76.5	7.8	10	73.5	3.99	1.19	>0.2
PCI11	114	89.0	6.9	11	86.2	8.29	1.25	>0.2
PCI12	103	90.7	6.2	10	88.5	4.26	1.09	>0.2
PCI16	81	65.2	6.2	10	62.2	3.91	1.48	>0.1

*Comparisons were not made where sample sizes in either population were less than ten.

6
Discontinuous Variation

The use of the so-called "discrete" traits for interpopulation comparisons has been advocated strongly by Anderson (1968), Berry and Berry (1967), and others, presumably because they are under reasonably direct genetic control (Ossenberg, 1970) and are not as phenotypically plastic as craniometric features. However, a survey of the literature reveals that the primary evidential support (ie., human pedigree studies) is generally lacking, and there are some indications (Bennett, 1965) that these characteristics may be secondary manifestations produced by stress or other factors. The implicit and often made assumption that one is calculating allele frequencies by computing frequencies of occurrence of certain discrete characteristics may be open to serious question (Corruccini, 1974). Furthermore, the etiologies of most discrete traits remain unknown. For example, an *os inca* is defined traditionally as an accessory bone on the occipital that is formed by a transverse suture from one asterion to the other. It might be argued convincingly that a lambdoid ossicle (fig. 10a and b), occurring in the same region but with the transverse suture extending from points on the right and left halves of the lambdoid suture, differs from an *os inca* only with regard to variable expressivity (if indeed there is a genetic predisposition for the trait). Yet, the two characteristics are nearly always scored separately. This is a typical problem that calls for investigation.

Nevertheless, if the assumption is made that a small part of the genetics of early populations may be determined by observation of the occurring frequencies of these discrete traits, then one is justified in counting them. The traits observed in the Mesa Verde crania correspond in part to those observed at Point of Pines and include lambdoidal wormian bones (fig. 11a and b) *os inca*, torus madibularis, metopism, pterion form (fig. 12a, b, and c), and dehiscences of the tympanic plate (Foramen of Huschke). As mentioned earlier, Corruccini (1974) surveyed briefly the etiological literature of these cranial variants, and Berry and Berry (1967) outlined their anatomical locations. They are described briefly below.

Lambdoidal wormian bones—Small accessory ossicles that occur anywhere in the lambdoid suture. They may include the entire thickness of the cranial wall, or only the inner or outer table.

Os inca—A triangular bone that occupies most of the occipital squama. The apex is at lambda, and the bone is separated from the rest of the occipital by a transverse suture running from the right to the left asterion.

Torus mandibularis—A bony exostosis that usually occurs bilaterally on the lingual surface of the mandible at the level of the first and second premolars and the first molar.

Metopism—The partial or complete retention of the frontal suture beyond the normal closure time of two or three years of age.

Pterion form—The type of contact made by the frontal, parietal, sphenoid, and temporal bones on both sides of the skull.

Dehiscence of the tympanic plate—Perforations, probably as a result of ossification defects, in the vaginal process (tympanic plate) of the tympanic portion of the temporal bone.

The frequencies of occurrence of these six discontinuous variants among both sexes at Mesa Verde (there is no evidence to indicate sex linkage among any of these traits) and their comparisons by Chi-square to the Point of Pines frequencies may be found in table 14. These comparisons offer further support to the contention that the two populations were similar in the skeletal morphology. Only one characteristic (mandibular torus) differed significantly ($P < 0.02$).

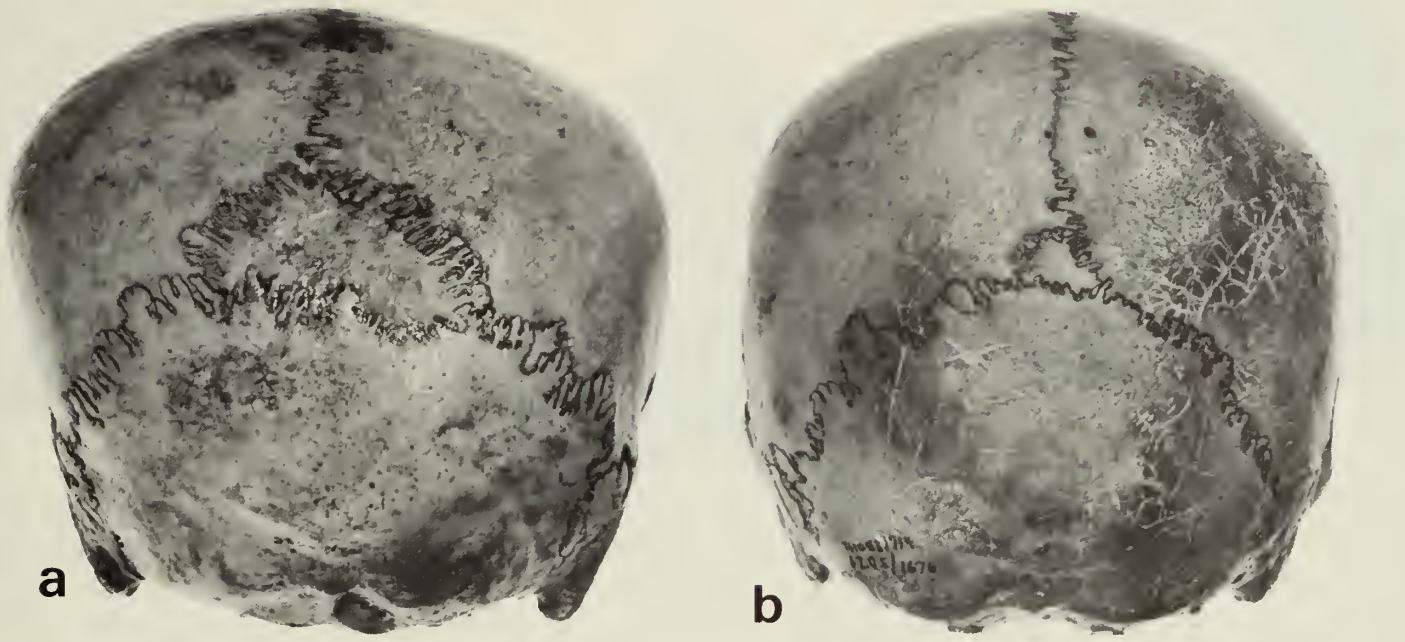


Figure 10 a, *Lambdoid ossicles in an adult male from Big Juniper House;* b, *lambdoid ossicles in an adult female from Site 1676.*

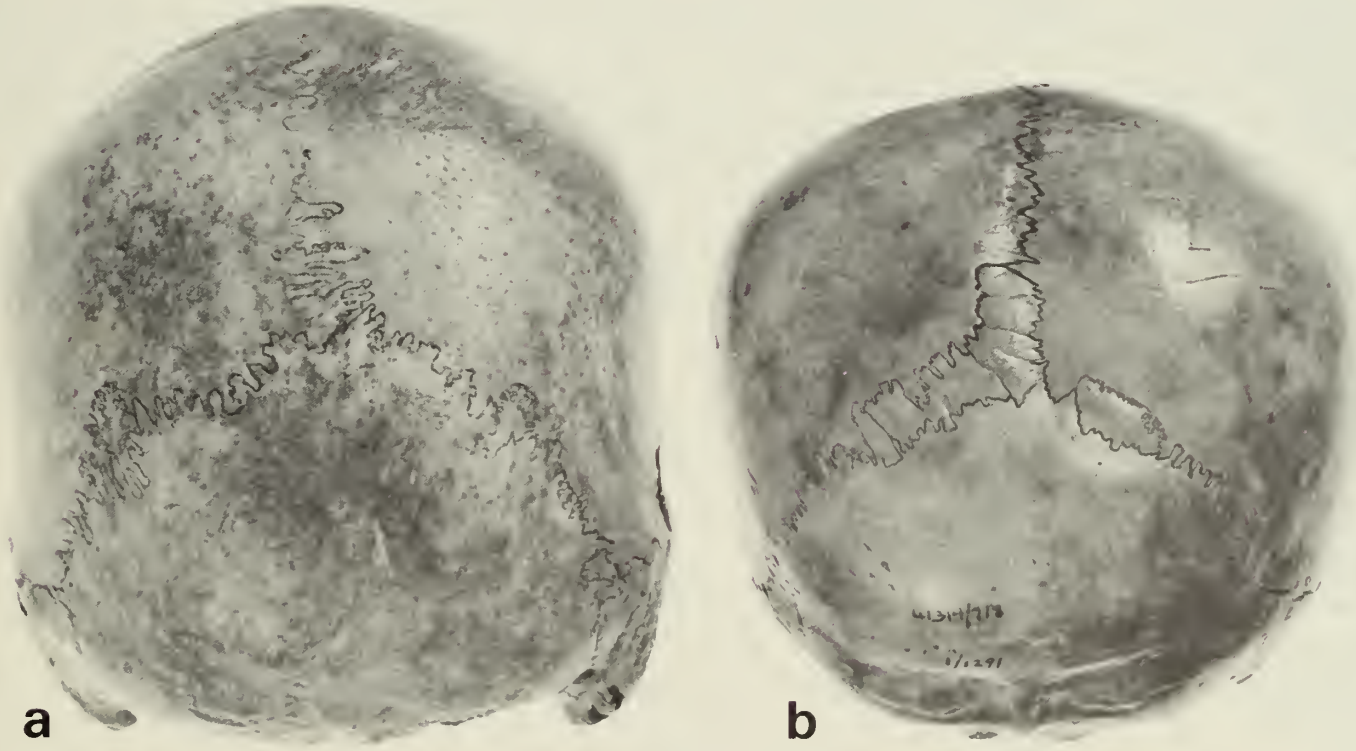


Figure 11 a, *Wormian bones on the lambdoid suture in an adult male from Mug House;* b, *wormian bones in a four to six year old child from Site 1291.*

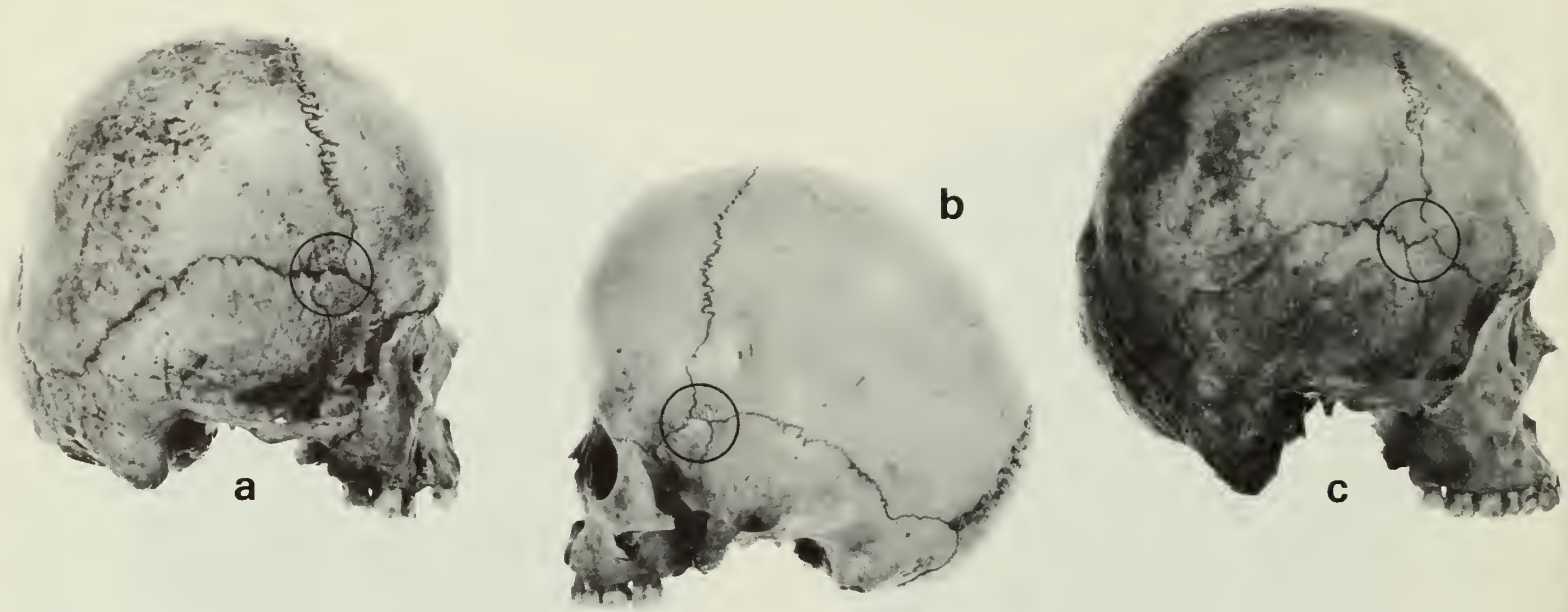


Figure 12 *"H" configuration at the pterion in:* **a**, *an adult female from Site 1676;* **b**, *a child from Big Juniper House; and* **c**, *an adult male from Mug House.*

Table 14. *Frequencies of six selected discontinuous variants among Mesa Verde and Point of Pines crania, chi-square values, and associated probability levels.*

	Mesa Verde		Point of Pines			
Variant	No.	Pct.	No.	Pct.	X^2	P
Wormian bones						
With	13	81.3	83	62.4	2.21	>0.1
Without	3		50			
Total	16		133			
Os inca						
With	3	17.6	11	8.3	1.57	>0.2
Without	14		122			
Total	17		133			
Torus mandibularis						
With	1	5.3	1	0.5	4.56	<0.02
Without	18		207			
Total	19		208			
Metopism						
With	0	0.0	5	2.3	0.41	>0.5
Without	17		208			
Total	17		213			
Pterion form						
"H"-shaped	17	100.0	27	100.0	identical	
"K"-shaped	0		0			
Total	17		27			
Dehiscence of the Tympanic Plate						
With	5	33.3	65	27.4	0.25	>0.5
Without	10		172			
Total	15		237			

7
Summary

The skeletal remains of 202 prehistoric Anasazi Indians from Mesa Verde National Park, Colorado, were examined in this report for two primary purposes. First, their skeletal characteristics were described. This included information on cranial deformation practices, age and sex distributions, estimations of average life expectancy at one year of age, minimum infant and adolescent mortality figures, estimations of stature, statistical descriptions of the variation in cranial and post-cranial metric variables, and calculations of the frequencies of several selected discontinuous traits. The second purpose was to determine the extent to which a hypothesized migration (Haury, 1958) of people and their cultural inventory (and, presumably, their genes) from the Kayenta Anasazi in northern Arizona into the Point of Pines area may have affected the skeletal structure of the Western Pueblo at Point of Pines.

If the available samples may be taken to represent adequately the Mesa Verde population, then several generalizations seem apparent. They were of rather short stature, with males averaging about 5 feet 4 inches and females about 5 feet, and as evidenced subjectively by post-cranial rugosity, were not heavily muscled. Mortality was very high in infancy, adolescence, and during the reproductive years in females, and this doubtlessly contributed to the low average life expectancy (probably no more than 30 years of age in both sexes).

From the standpoint of skeletal morphology, the Anasazi from Mesa Verde are essentially indistinguishable from the Western Pueblo at Point of Pines. It has been shown in the preceding sections that both metric and non-metric characteristics seldom differed significantly between the two populations. If Bennett (1973a) is correct in the assumption of population homogeneity through time at Point of Pines, and if it is assumed that the Mesa Verde and Kayenta Anasazi represent regional groups belonging to the same population, then the hypothesized migration into the Point of Pines area late in the thirteenth century can be neither refuted nor supported by the skeletal evidence.

Appendix 1

Cranial measurements by site from Mesa Verde National Park, Colorado.

Measurement No.	Site 1676				Two Raven House			
	41049	41053	41307	41050	36758	36766	36771	36773
C1	159	159	170	168				
C2	150	151	137	147				
C3	135	142	143	136				
C4	119	120	117	118				
C5		98	92	90	91	93	97	87
C6	141	139	139	131	127	130	137	125
C7	99	96	110	96				
C8	97	90	105	94				
C9	123	108	116	111	106	115		117
C10	76	67	67	72	61	65	67	64
C11	50	47	49	45	47	47	49	46
C12	24	26	27	25	28	26	25	25
C13	33	36	34	34	34	34	36	34
C14	39	37	39	37	34	37	38	36
C15	27	25	26	25	25	26	27	23
C16	99	98	101	94	94	97	98	91
C17	53	47	56	54	50	51	59	55
C18	70	59		64	63	64	72	60
C19	123	123	118	126	130	115	130	116
C20	112	104	83	100	98	91	103	84
C21	37	30	36	31	26	34	37	31
C22	38	29	37	37	36	35	40	34
C23	106	95	103	103				102
Sex	M	F	M	M	F	M	M	F
Age	30–35	30–35	40+	35–40	adult	adult	adult	adult

Measurement No.	Mug House							
	23686	23687	24019	24024	24028	24030	24033	24034
C1								
C2								
C3								
C4								
C5	88	101		89	99	94	96	
C6	128	149		129	143	134	141	
C7	100	102		96	105	97	102	
C8	91	90		92	92	95	95	
C9	96	120		92	127	112	119	
C10	68	74		71	83	67	71	
C11	51	55		49	56	50	50	
C12	28	25		27	25	25	26	
C13	35	37		34	36	33	33	
C14	37	40		39	44	37	39	
C15								
C16	95	101		97	103	95	101	
C17	51	53			55	66	54	54
C18	57	61			68	66	66	62
C19		128		111	118	115	125	117
C20		112	93	93	97	91	109	100
C21	26	36	30	35	38	31	34	33
C22	30	35	37	34	36	36	38	35
C23	110	110		97	105	103	119	105
Sex	F	M	M	F	M	M	M	M
Age	25–30	30–35	40+	20–25	35–40	20–25	40–45	45+

Measurement No.	Long House							
	13638	13639	13643	13646	13651	13652	13659	13665
C1	150	169	168		163	162	176	137
C2			145		151	138	141	149
C3	138	139	147		145		136	139
C4								
C5		94	101		95		95	91
C6					138		139	114
C7		95	100		106		102	90
C8		90	91		98		96	80
C9				110	133	121	128	100
C10			70	68	84	71	80	60
C11	47	50	56	49	56	50	55	43
C12		26	30	25	26	25	26	21
C13	33	33	34		36	34	35	32
C14	38	43	40		38	34	38	35
C15			25		25	20	23	17
C16		94	101		100		100	85
C17								
C18								
C19				114			117	104
C20				95		98	99	77
C21		35	34		36	33	34	26
C22	35	41		36	36	35	38	29
C23								
Sex	F	M	M	M	M	F	M	?
Age	adult	adult	adult	adult	adult	adult	adult	child

Measurement No.	Big Juniper House					St. 1241	St. 1253
	32888	33542	33544	33547	37265	41000	41036
C1							
C2							
C3						135	156
C4						119	
C5		86		95	83	90	97
C6		98		125		125	142
C7						98	102
C8						97	95
C9	121	94	109	120	82	123	122
C10	72	54	63	76	51	72	76
C11	47	41	46	51	34	50	56
C12	25	22	24	23	17	25	23
C13	35	30	33	37	31	35	37
C14	36	33	33	37	31	36	38
C15	29	19		25	16	26	26
C16	98	80			75	95	100
C17		43		58	37	55	56
C18		53		66	53	67	63
C19		100		116		111	121
C20	92	77		96		91	102
C21	38	25		34		37	34
C22	36	31		32		34	37
C23		81		97		109	107
Sex	M	?	F	M	?	M	M
Age	adult	adol.	adult	adult	adol.	20–25	30–35

Appendix 1 (con't)

Measurement No.	Badger House				St. 1291	Mesa Verde Museum	
	27262	28903	28908	28925	41314	641/85	657/148
C1						170	
C2						136	
C3						129	
C4							
C5	93				88	87	
C6					106	133	
C7		98				95	
C8		89				84	
C9	123				93		
C10	78	72			57	63	
C11	55	51	55		39	54	
C12	26	26	24		23	24	
C13	35	34			36	36	
C14	39	38			33	40	
C15						17	
C16	97					91	
C17	56	53	47		35		
C18	72	63	60		57		
C19				117	93		126
C20			89	99	70		107
C21			31	39	26		37
C22			37	30	25		36
C23				105	69		
Sex	M	M	F	F	?	M	M
Age	adult	adult	adult	adult	4–6	adult	adult

Measurement No.	Mesa Verde Museum						
	671/75	673/85	1081/85	1089/99	1093/85	1094/85	1129/85
C1	177	162	180			165	
C2	135	143	137			140	
C3	135	143	137			136	
C4							
C5	96	102	100				
C6	139	135	137			125	
C7			102			97	
C8			92			97	
C9							
C10		71				62	
C11	52	49				44	
C12	27	24				23	
C13	36	36	35			32	
C14	41	43	41			37	
C15	20	23	23				
C16	98	103	103				
C17							
C18							
C19				123	118		126
C20				93	80		94
C21				32	33		38
C22				36	36		35
C23							
Sex	M	M	M	?	?	F	?
Age	adult	adult	adult	adult	adult	adult	adult

Measurement No.	Mesa Verde Museum					
	2632/85	2851/169	2866/175	2884/175	3110/208	3473/304
C1		150	157	199	140	177
C2		137	142	142	148	135
C3		133	135		138	132
C4						
C5						
C6		119	131	121	122	
C7		92	95	95	89	102
C8		95	92	91	85	
C9		109		111		
C10		65	63	65	59	
C11		44	49	45	43	
C12		25	24	25	23	
C13		32		33	32	
C14		36		35	36	
C15		23	23	24	20	
C16		93	99	93	91	
C17						
C18						
C19	115	105	119	100		
C20	110	84	95	89		
C21	36	30		31		
C22	38	33		33		
C23						
Sex	?	F	F	F	?	M
Age	adult	adult	adult	adult	adult	adult

Appendix 2

Cranial indices by site from Mesa Verde National Park, Colorado.

Index No.	Site 1676				Two Raven House			
	41049	41053	41307	41050	36758	36766	36771	36773
CI1	94.3	94.9	80.6	87.5				
CI2	148.0	150.7	150.0	150.3				
CI3	87.1	91.6	92.9	86.1				
CI4	84.9	98.3	84.1	80.9				
CI5	90.0	94.0	104.4	92.5				
CI6	53.9	48.2	48.2	54.9	48.0	50.0	48.9	51.2
CI7	87.2	77.7	83.5	84.7	83.5	88.5		93.6
CI8	48.0	55.3	55.1	55.6	59.6	55.3	51.0	54.3
CI9	84.6	97.3	87.2	91.9	100.0	91.9	94.7	94.4
CI10	132.1	125.5		118.5	126.5	125.5	122.0	109.1

Index No.	Mug House							
	23686	23687	24019	24024	24028	24030	24033	24034
CI1								
CI2								
CI3								
CI4								
CI5								
CI6	53.1	49.7		55.0	58.0	50.0	50.4	
CI7	75.0	80.5		90.7	88.8	83.6	84.4	
CI8	54.9	45.5		55.1	44.6	50.0	52.0	
CI9	94.6	92.5		87.2	81.8	89.2	84.6	
CI10	111.8	115.1			123.6	100.0	122.2	114.8

Index No.	Long House							
	13638	13639	13643	13646	13651	13652	13659	13665
CI1			86.3		92.6	85.2	80.1	108.8
CI2			153.3		153.0		151.0	141.7
CI3			93.6		92.4		85.5	97.2
CI4			87.5		88.9		77.3	101.5
CI5			101.4		96.0		96.5	93.3
CI6					60.9		57.6	52.6
CI7					96.4		92.1	87.7
CI8		52.0	53.6	51.0	46.4	50.0	47.3	48.8
CI9	86.8	76.7	85.0		94.7	100.0	92.1	91.4
CI10								

Index No.	Big Juniper House					St. 1241	St. 1253
	32888	33542	33544	33547	37265	41000	41036
CI1							
CI2							
CI3							
CI4							
CI5							
CI6		55.1		60.8		57.6	53.5
CI7		95.9		96.0		98.4	85.9
CI8	53.2	53.7	52.2	45.1	50.0	50.0	41.0
CI9	97.2	90.9	100.0	100.0	100.0	97.2	97.4
CI10		123.3		113.8	143.2	121.8	112.5

Index No.	Badger House				St. 1291	Mesa Verde Museum	
	27262	28903	28908	28925	41314	641/85	657/148
CI1						80.0	
CI2						145.0	
CI3						84.3	
CI4						75.9	
CI5						94.9	
CI6					53.8	47.4	
CI7					87.7		
CI8	47.3	51.0	43.6		58.9	44.4	
CI9	89.7	89.5			91.7	90.0	
CI10	128.6	118.9	127.7		162.9		

Index No.	Mesa Verde Museum						
	671/75	673/85	1081/85	1089/99	1093/85	1094/85	1129/85
CI1	76.3	88.3	76.1			85.8	
CI2	149.0	149.0	151.3			147.0	
CI3	86.5	93.5	86.2			88.9	
CI4	76.3	88.3	76.1			82.4	
CI5	100.0	100.0	100.0			97.1	
CI6		52.6				49.6	
CI7							
CI8	51.9	49.0				52.3	
CI9	87.8	83.7	85.4			86.5	
CI10							

Index No.	Mesa Verde Museum					
	2632/85	2851/169	2866/175	2884/175	3110/208	3473/304
CI1		91.3	90.4	71.4	105.7	76.3
CI2		140.0	144.7		142.0	148.0
CI3		92.4	90.0		95.8	84.6
CI4		88.7	86.0		98.6	74.6
CI5		97.1	95.1		93.2	97.8
CI6		54.6	48.1	53.7	48.4	
CI7		91.6		91.7		
CI8		56.8	49.0	55.6	53.5	
CI9		88.9		94.3	88.9	
CI10						

Appendix 3

Post-Cranial measurements by site from Mesa Verde National Park, Colorado.

Measurement No.	Site 1676					Two Raven House				
	41049	41305	41053	41307	41050	36759	36766	36771	36773	36761
PC1	303		289	299	298		295	308		
PC2	21		22	21	19		24	19		25
PC3	17		15	15	14		16	14		16
PC4	48		40	40	44					
PC5	63		62	62	57					
PC6	307		292	299	301	291				
PC7	20		22	23	20	21				25
PC8	16		15	15	15	15				17
PC9	46		41	39	44	37				
PC10	62		63	65	58					
PC11	149		131	135	141					
PC12	149		136	139	141					
PC13	438		413	423	425		422	433		
PC14	434		406	418	422		417	423		
PC15	85		79	85	79		73	81		
PC16	44		41	42	44					42
PC17	24		22	24	23		21	22		
PC18	44		31	28	33		28	30		
PC19	31		27	30	25		24	27		26
PC20	22		23	24	27		22	22		26
PC21		421	409	420	420					
PC22		418	403	416	417					
PC23		85	77	81	79					
PC24		41	42	42	44					
PC25		25	22	22	22					
PC26		28	30	29	32					
PC27		28	27	28	25					
PC28		26	22	22	26					
PC29	378	360	343	348	369		357	353		
PC30	36	33	31	34	33		31	32		34
PC31	25	21	20	18	21		23	22		20
PC32	87	78	78	78	82		70	74		
PC33	32	30	30	31	30		27	29		
PC34	22	21	19	17	21		21	22		
PC35	373		343	352	366					
PC36	35		32	33	34					
PC37	25		21	18	20					
PC38	85		80	78	81					
PC39	32		29	30	31					
PC40	21		19	17	20					
PC41	249		225	228	237		235		220	
PC42	236		212	215	225		226		208	
PC43	245		230	234	238					
PC44	233		219	221	225					
PC45	265		237	247	253		253		234	
PC46			242	252	257					
PC47			109	106	111			135		
PC48			122	120	115			114		
PC49	360		336	340	348					
PC50	352		334	341	348					
Sex	M	M	F	M	M	F	M	M	F	M
Age	30–35	adult	30–35	40+	35–40	adult	adult	adult	adult	40+

Measurement No.	Mug House									
	23686	23687	24013	24021	24024	24025	24028	24030	24033	24034
PC1		314		295	275	267	329	309	330	311
PC2	19	21		19	21	19	20	19	23	21
PC3										
PC4	40	46		39	34	35	45	42	47	44
PC5										
PC6	298	319		295	279		336	305	335	
PC7	21	23		20	21	20	21	21	24	
PC8										
PC9	40	47		40	41	36	46	42	48	
PC10										
PC11		167				129	167	147	155	
PC12		164						154	168	
PC13		444	393	405		375	469	427	448	
PC14		440	388	401		370	466	420	445	
PC15										
PC16		45	39	41		36	45	42	46	
PC17	23	26	20	22		21	26	22	27	
PC18	30	31	26	29		29	32	29	37	
PC19	26	28	21	24		21	29	26	31	
PC20	23	24	19	22		19	24	22	24	
PC21	425	450	393	403			466	421	452	413
PC22	421	444	388	398			464	417	450	411
PC23										
PC24	41	45	39	41	36	37	47	41	46	43
PC25	22	26	20	23	21	20	26	21	26	24
PC26	30	32	26	29	29	28	32	29	37	29
PC27	27	27	21	23			30	24	32	29
PC28	22	24	19	23			24	21	23	22
PC29	339	368	330	347		314	394	368		
PC30	29	38	28	31		29	37	36	37	
PC31	18	21	15	17		17	23	23	24	
PC32										
PC33										
PC34										
PC35		366	328	346			390	380		
PC36		37	29	31			36	39	39	
PC37		21	16	14			23	26	25	
PC38										
PC39										
PC40										
PC41	227	248	209	235			259	240	262	
PC42										
PC43	229	246		237	221	199	260	236	258	242
PC44										
PC45	242	266		250		215	276	256	278	
PC46		262	227	255	237	217	275	252	278	
PC47	77	112	97	105	103	88	111	112	98	
PC48	120	116	100	111	120	108	121	114	116	
PC49	328	353	320	339		301		348	376	
PC50		353		340			378	348	373	
Sex	F	M	F	M	F	F	M	M	M	M
Age	25–30	30–35	40+	25–30	20–25	35–40	35–40	20–25	40–45	45+

Appendix 3 (con't.)

Measurement No.	Long House									
	13639	13643	13646	13651	13659	13636	13638	13642	13650	13652
PC1					308					
PC2										
PC3										
PC4										
PC5										
PC6		318		318	312		279			294
PC7										
PC8										
PC9										
PC10										
PC11										
PC12										
PC13			448		412	413	398	400		412
PC14										
PC15										
PC16			42			38	35	40		40
PC17			21		23	21	21	21		22
PC18			27		30	27	30	29		29
PC19	27		28		28	25	23	24		25
PC20	26		21		25	21	22	22		23
PC21	456		446	436	419					415
PC22										
PC23										
PC24	45	43		42	42		36	40		40
PC25	25	26	21	23	23	21	20	22	22	22
PC26	35	35	28	29	32	28	29	30	30	29
PC27	26	32	29	28	27	25	24	24	21	24
PC28	26	26	20	22	24	21	20	23	14	23
PC29				371	372	346	326			364
PC30		41	32	36	35	33	29			31
PC31		23	20	19	21	20	19			20
PC32										
PC33										
PC34										
PC35			366	367	365		326			
PC36	36	42	31	37	38	31	30			
PC37	24	22	19	19	21	22	18			
PC38										
PC39										
PC40										
PC41	245			240						
PC42										
PC43	245			244	247					
PC44										
PC45				254	264				239	
PC46				256	261				219	
PC47										
PC48							111			
PC49										
PC50						333				
Sex	M	M	M	M	M	F	F	F	F	F
Age	adult	adult	adult	adult	adult	adult	adult	adult	adult	adult

Measurement	Big Juniper House					St. 1249	St. 1575	St. 1241	St. 1253
No.	32888	32890	33547	33552	33555	33654	31834	41000	41306
PC1	303	287		282				274	324
PC2	19			19				21	23
PC3	15			13				13	16
PC4								38	45
PC5								55	65
PC6						301		279	324
PC7						21		21	25
PC8						14		15	17
PC9						36		38	44
PC10						60		56	68
PC11			137					139	152
PC12								139	153
PC13						413		384	451
PC14						406		382	449
PC15						75		66	84
PC16						39		37	42
PC17						21		17	24
PC18						28		26	33
PC19						25		23	25
PC20						22		19	28
PC21						409	391	381	450
PC22						405	386	379	447
PC23						75	67	66	86
PC24						39	36	37	43
PC25						21	19	17	27
PC26						29	26	26	34
PC27						25	22	22	24
PC28						22	20	20	26
PC29			357			333		323	376
PC30			32			31		31	40
PC31			20			18		19	25
PC32			69			72		73	89
PC33			31			27		28	34
PC34			18			17		17	23
PC35					328	337		322	382
PC36						32		31	41
PC37						19		18	26
PC38						72		72	91
PC39						29		27	33
PC40						18		17	25
PC41		218			215	228		213	
PC42						216		201	
PC43							214	215	249
PC44							204	204	236
PC45		234						231	264
PC46					230		228	231	267
PC47						117		104	
PC48						111		119	
PC49								308	374
PC50								308	376
Sex	M	M	M	F	F	M	F	M	M
Age	adult	adult	adult	adult	adult	35–40	adult	20–25	30–35

Appendix 3 (con't.)

Measurement No.	Badger House								
	27143	27262	28062	28063	28903	28909	28910	28923	28916
PC1		303					311		
PC2		23					21		
PC3									
PC4		40		43			44		
PC5									
PC6					295		310	325	
PC7					22		20	20	
PC8									
PC9					45		44	45	
PC10									
PC11					150				
PC12					150				
PC13		418			427		438		400
PC14		412			421		435		393
PC15									
PC16		40			45				40
PC17		23			27		23		
PC18		32			33		30		
PC19		24			30		26		26
PC20		25			22		20		22
PC21			43		415	445			
PC22					411	444			
PC23									
PC24						45			
PC25			25		25	28			
PC26			29		32	36			
PC27					27	28			
PC28					23	26			
PC29	345				371		376		346
PC30	34	34			38		35		31
PC31	22	22			23		20		20
PC32									
PC33									
PC34									
PC35					362		370		343
PC36			36		38		34		32
PC37			18		23		20		21
PC38									
PC39									
PC40									
PC41		234		258	239		241		
PC42									
PC43					242				219
PC44									
PC45				271			258		
PC46					255				
PC47					119				116
PC48				118					119
PC49					357		368		333
PC50							363		331
Sex	M	M	M	M	M	M	M	M	F
Age	adult	adult	adult	adult	adult	adult	adult	adult	adult

Appendix 4

Post-Cranial indices by site from Mesa Verde National Park, Colorado.

Index No.	Site 1676				Two Raven House					
	41049	41305	41053	41307	41050	36759	36766	36771	36773	36761
PCI1			72.5	71.9	72.2					
PCI2	69.8		71.2	71.5	70.6		70.7	72.8		
PCI3	80.0		68.2	65.2	75.0	71.4				68.0
PCI4	81.0		68.2	71.4	73.3		66.7	73.7		64.0
PCI5	48.5		46.6	46.5	46.8					
PCI6	49.2		45.3	45.2	47.3					
PCI7		107.7	122.7	127.3	96.2					
PCI8	140.9		117.4	125.0	92.6		109.1	122.7		
PCI9		89.3	73.3	69.0	68.8					
PCI10	54.5		70.9	85.7	69.7		75.0	73.3		
PCI11		92.8	81.5	78.6	104.0					
PCI12	70.9		85.2	80.0	108.0		91.7	81.5		100.0
PCI13			85.1	84.6	87.8					
PCI14	87.1		84.5	83.3	87.4		85.6	83.5		
PCI15	71.4		65.6	54.5	58.8					
PCI16	69.4	63.3	64.5	52.9	63.6		74.2	68.8		58.8
PCI17	65.5		65.6	56.7	64.5					
PCI18	68.8	70.0	63.3	54.8	70.0		77.8	75.9		
PCI19	79.8		78.7	78.3	79.1					
PCI20	82.2		77.9	76.3	79.5		79.7			
PCI21			111.9	113.2	103.6			84.4		

Index No.	Mug House									
	23686	23687	24013	24021	24024	24025	24028	24030	24033	24034
PCI1	70.8	71.8		74.1			72.4	73.1	74.4	
PCI2		71.4		73.6		72.2	70.6	73.6	74.2	
PCI3										
PCI4										
PCI5		51.4						50.5	50.1	
PCI6		53.2				48.3	50.8	47.6	47.0	
PCI7	122.7	112.5	110.5	100.0			125.0	114.3	139.1	131.8
PCI8	113.0	116.7	110.5	109.1		110.5	120.8	118.2	129.2	
PCI9	73.3	81.3	76.9	79.4	72.4	71.4	81.3	72.4	70.3	83.3
PCI10	76.7	83.9	76.9	75.9		72.4	81.3	75.9	73.0	
PCI11	81.5	88.9	90.5	100.0			80.0	87.5	71.9	75.9
PCI12	88.5	85.7	90.5	91.7		90.5	82.8	76.9	77.4	
PCI13		82.4	84.5	86.9			84.1	91.1		
PCI14		83.6	85.1	86.5		84.9	84.5	87.6		
PCI15		56.8	55.2	54.8			63.9	66.7	64.1	
PCI16	62.1	55.3	53.6	54.8		58.6	62.2	63.9	64.9	
PCI17										
PCI18										
PCI19	76.8	77.1		80.3	79.2		77.4	77.4	77.0	
PCI20	76.2	79.0		79.7			78.7	77.7	79.4	
PCI21	155.8	103.6	103.1	105.7	116.5	122.7	109.0	101.8	118.4	

Appendix 4 (con't.)

Index No.	Long House									
	13639	13643	13646	13651	13659	13636	13638	13642	13650	13652
PCI1										
PCI2										
PCI3										
PCI4										
PCI5										
PCI6										
PCI7	100.0	123.1	145.0	127.3	112.5	119.0	120.0	104.3	150.0	104.3
PCI8	103.8		133.3		112.0	119.0	104.5	109.1		108.7
PCI9	71.4	74.3	75.0	79.3	71.9	75.0	69.0	73.3	73.3	75.9
PCI10			77.8		76.7	77.8	70.00	72.4		75.9
PCI11	100.0	81.3	69.0	78.8	88.9	84.0	83.3	95.8	66.7	95.8
PCI12	96.3		75.0		89.3	84.0	95.7	91.7		92.0
PCI13										
PCI14										
PCI15	66.7	52.4	61.3	51.4	55.3	71.0	60.0	60.0		63.3
PCI16		56.1	62.5	52.8	60.0	60.6	65.5			64.5
PCI17										
PCI18										
PCI19				76.7	79.2					
PCI20										
PCI21										

Index No.	Big Juniper House					St. 1249	St. 1575	St. 1241	St. 1253
	32888	32890	33547	33552	33555	33654	31834	41000	41306
PCI1						74.3		73.6	72.5
PCI2								71.7	72.2
PCI3						66.7		71.4	68.0
PCI4	78.9			68.4				61.9	69.6
PCI5								49.8	47.2
PCI6								50.7	46.9
PCI7						113.6	110.0	110.0	92.3
PCI8						113.6		121.1	89.3
PCI9						72.4	73.1	65.4	79.4
PCI10						75.0		65.4	72.7
PCI11						80.0	90.9	90.9	108.3
PCI12						88.0		82.6	112.0
PCI13						83.2		85.0	85.5
PCI14						82.0		84.6	83.7
PCI15						59.4		58.1	63.4
PCI16			62.5			58.1		61.3	62.5
PCI17						62.1		63.0	75.8
PCI18			58.1			54.8		60.7	67.6
PCI19								77.1	76.9
PCI20		76.0						77.7	
PCI21						94.9		114.4	

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